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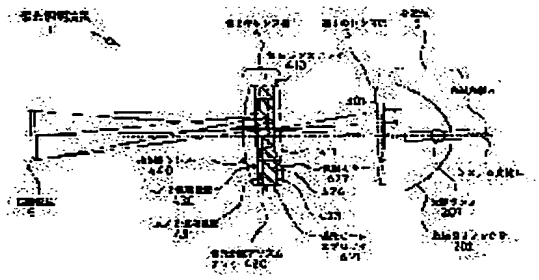
54) POLARIZED LIGHT ILLUMINATOR AND PROJECTION TYPE DISPLAY DEVICE

57)Abstract:
URPOSE: To constitute a miniaturized and compact polarized light luminator where an integrator optical system and a polarized light onversion optical system are combined and whose light utilization fficiency is high.
ONSTITUTION: This polarized light illuminator 1 is provided with a light ource part 2 emitting light whose polarization direction is random, a 1st ns plate 3 constituted of plural rectangular condenser lenses whose utside shape is rectangular and condensing the light emitted from the ght source so that plural secondary light source images may be formed, nd a 2nd lens plate 4 placed near a position where the plural secondary ght source images are formed and equipped with a condenser lens array, polarized light separation prism array 420, a λ/2 phase difference plate 30, and an emitting side lens 440. In a stage where the minute secondary ght source image is formed by the 1st lens plate 3 constituting the ntegrator optical system, polarized light is separated. Therefore, since the patial spread of an optical path associated with the separation of the olarized light is restrained, the illuminator 1 is miniaturized though it is rovided with the polarized light conversion optical system.



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NOTICES *

LAIMS

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laim(s)]
laim 1] The light source section to which the polarization direction carries out outgoing radiation of the random ght. The 1st lens board for consisting of two or more rectangle condenser lenses which have a rectangle-like pearance, condensing the light by which outgoing radiation is carried out from the aforementioned light source ction, and forming two or more secondary light source images. It is placed near the position in which two or more oremention secondary light source images are formed, and they are a condenser lens array, a polarization paration prism array, lambda / 2 phase-contrast board, and an outgoing radiation side lens. It is the polarization ghting system equipped with the above, and is characterized by consisting of two or more polarization beam splitters id two or more reflective mirrors, arranging the aforementioned lambda / 2 phase-contrast board at the outgoing diation side side of the aforementioned polarization separation prism array, and arranging the aforementioned itgoing radiation side lens at the outgoing radiation side side of the aforementioned lambda / 2 phase-contrast board.
laim 2] The aforementioned condenser lens which constitutes the lens board of the above 2nd in a claim 1 is a larization lighting system characterized by being the aforementioned rectangle condenser lens and analog which nstitute the lens board of the above 1st.
laim 3] Two or more aforementioned polarization beam splitters which constitute the lens board of the above 2nd in claim 1 are polarization lighting systems characterized by being set as the size configuration corresponding to the ze and configuration of the secondary aforementioned light source images of the aforementioned rectangle condenser ns which constitute the lens board of the above 1st, and which are alike, respectively and are therefore formed.
laim 4] The aforementioned condenser lens which constitutes the lens board of the above 2nd in a claim 3 is a larization lighting system characterized by being set as the size configuration corresponding to the size and nfiguration of the secondary aforementioned light source images of the aforementioned rectangle condenser lens hich constitute the lens board of the above 1st, and which are alike, respectively and are therefore formed.
laim 5] a claim 1 or which term of 4 -- setting -- the aforementioned light source section and the 1st lens of the ove -- the polarization lighting system characterized by arranging the deflection lens at a wooden floor
laim 6] It is the polarization lighting system characterized by uniting the aforementioned deflection lens with the ns board of the above 1st in a claim 5.
laim 7] At least one of the aforementioned rectangle condenser lenses which constitute the lens board of the above st in a claim 1 or which term of 4 is the polarization lighting system characterized by being the lens of an eccentric stem.
laim 8] At least one of the aforementioned condenser lenses which constitute the aforementioned condenser lens ray of the lens board of the above 2nd in a claim 1 or which term of 4 is the polarization lighting system aracterized by being an eccentric system lens.
laim 9] The polarization lighting system characterized by omitting the aforementioned outgoing radiation side lens hich is the component of the lens board of the above 2nd by adjusting the eccentricity of the aforementioned centric system lens of the aforementioned condenser lens array at least in a claim 8.
laim 10] The polarization lighting system characterized by arranging in a claim 1 or which term of 4 in the position here only the amount of the half of the breadth of the aforementioned polarization beam splitter carried out the rallel displacement of the optical axis of the aforementioned light source section, and the lens board of the above 1st the system optical axis.
laim 11] The breadth of the aforementioned condenser lens which constitutes the aforementioned condenser lens ray of the lens board of the above 2nd in a claim 1 or which term of 10 is a polarization lighting system characterized y being equal to the breadth of the aforementioned polarization beam splitter.
laim 12] It is the polarization lighting system characterized by forming the aforementioned lambda / 2 phase-contrast

)ard by TN (Twisted Nematic) liquid crystal in a claim 1 or which term of 11.
]laim 13] The aforementioned polarization separation prism array is a polarization lighting system characterized by ıving the square pole-like prism composition object with which the reflective film was formed in the interior as the]orementioned reflective mirror while having the square pole-like prism composition object with which the]orementioned polarization demarcation membrane was formed in the interior as the aforementioned polarization ɜam splitter in the claim 1 or which term of 12.
]laim 14] The aforementioned prism composition object with which the aforementioned polarization demarcation .embrane was formed in the claim 13, and the aforementioned prism composition object with which the]orementioned reflective mirror was formed are a polarization lighting system characterized by being arranged by the ngle tier in the right-angled direction to the aforementioned system optical axis.
]laim 15] It is the polarization lighting system characterized by to be arranged the aforementioned prism composition)ject with which the aforementioned polarization demarcation membrane was formed, and the aforementioned prism)mposition object with which the aforementioned reflective mirror was formed in a claim 14 so that each of the]orementioned polarization demarcation membrane may serve as the almost same degree of tilt angle to the]orementioned system optical axis while they are arranged by turns in the right-angled direction to the aforementioned ′stem optical axis.
]laim 16] The aforementioned prism composition object with which the aforementioned polarization demarcation .embrane was formed in the claim 14, and the aforementioned prism composition object with which the]orementioned reflective mirror was formed are the polarization lighting system characterized by to arrange each of .e aforementioned polarization demarcation membrane with the symmetrical degree of tilt angle to the optical axis)ncerned on both sides of the aforementioned system optical axis while being arranged in the right-angled direction to .e aforementioned system optical axis.
]laim 17] Polarization lighting system. The modulation means equipped with the liquid crystal light valve in which .e polarization light contained in the flux of light from this polarization lighting system is modulated, and image .formation is included. The aforementioned polarization lighting system is the light source with which outgoing .diation of the light with the polarization direction random in the projected type display which has the projection)tical system which indicates the modulation flux of light by projection on a screen is carried out. The 1st lens board ır consisting of two or more rectangle condenser lenses which have a rectangle-like appearance, condensing the light ɣ which outgoing radiation is carried out from the aforementioned light source, and forming two or more secondary ght source images. It is placed near the position in which two or more aforementioned secondary light source images ·e formed, and they are a condenser lens array, a polarization separation prism array, an outgoing radiation side lens, ıd lambda / 2 phase-contrast board. It is the projected type display equipped with the above, and it consists of two or ıore polarization beam splitters and two or more reflective mirrors, and is characterized by arranging the]orementioned lambda / 2 phase-contrast board at the outgoing radiation side side of a polarization separation prism ray.
]laim 18] The projected type display which carries out [that a projection indication of the synthetic flux of light hich has further a colored-light separation means divide the flux of light from the aforementioned polarization ghting system into the two or more flux of lights, and a colored-light composition means compound the modulation ux of light after the aforementioned modulation means became irregular, in a claim 17, and was acquired by the)lored-light composition means concerned is given on a screen through the aforementioned projection optical system, ıd] as the feature.

[ranslation done.]

NOTICES *

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ETAILED DESCRIPTION

)etailed Description of the Invention]
)001]
he technical field to which invention belongs] this invention relates to the polarization lighting system which luminates a rectangular lighting field etc. uniformly using the polarization light which arranged the polarization rection. Moreover, this invention relates to the projected type display which modulates the polarization light by hich outgoing radiation was carried out from this polarization lighting system by the liquid crystal light valve, and urries out the enlarged display of the image on a screen.
)002]
)escription of the Prior Art] The integrator optical system using two lens boards as optical system which illuminates iiformly the lighting field of rectangles, such as a liquid crystal light valve, is known from before. Integrator optical 'stem is indicated by JP,3-111806,A and is already put in practical use as a lighting system of the projected type splay using the liquid crystal light valve.
)003] Integrator optical system is the same as that of what is used for the exposure machine, and it divides the flux of ght from the light source with two or more rectangle condenser lenses which constitute the 1st lens board, and it is ade it to carry out superposition image formation on one lighting field through the 2nd lens board of composition of aving had the condenser lens group corresponding to each rectangle condenser lens for the image (light source image) arted with each rectangle condenser lens theoretically. In this optical system, while the use efficiency (lighting fficiency) of light source light improves, the luminous-intensity distribution which illuminates a liquid crystal light alve can be made almost uniform.
)004] On the other hand, in the common projected type display using the liquid crystal light valve of the type which odulates polarization light, since only one kind of polarization light can be used, the abbreviation half of the light om the light source which emits a random polarization light is not used. Then, the proposal which raised the use fficiency of light is made by enabling use of the light which is not used. A typical example is EURODISPLAY. '90 he polarization conversion optical system which is indicated from 64 pages to 67 pages of PROCEEDINGS, and was ainly equipped with the polarization beam splitter, and the lambda / 2 phase-contrast board like is used. In a liquid 'ystal light valve, polarization conversion optical system changes the polarization light of the kind which cannot be sed into the polarization light of the kind which the liquid crystal light valve concerned can use, and raises the use fficiency of light source light.
)005]
'roblem(s) to be Solved by the Invention] It is possible by combining above-mentioned integrator optical system and)ove-mentioned polarization conversion optical system here to raise further the use efficiency of the light from light)urce light. However, when these are combined simply, the breadth of the whole optical system will be expanded vice [about]. For this reason, unless the projection lens of the diameter of macrostomia is used extremely, it will ecome difficult to attain the miniaturization of about [that efficiency for light utilization in projected type display ith the small f number cannot be improved] and optical system.
)006] The technical problem of this invention is for it to be small and constitute compactly the high polarization ghting system of the efficiency for light utilization which combined integrator optical system and polarization)nversion optical system in view of this point.
)007] Moreover, the technical problem of this invention has such high efficiency for light utilization, and it is to alize possible projected type display of acquiring a bright projection picture, without using the projection lens of the nall diameter of macrostomia of the f number by using a small and compact polarization lighting system.
)008]
Means for Solving the Problem] In order to solve the above-mentioned technical problem, the polarization lighting

/stem of this invention Consist of two or more rectangle condenser lenses which have the light source section to hich the polarization direction carries out outgoing radiation of the random light, and a rectangle-like appearance, and ıe light by which outgoing radiation is carried out from the aforementioned light source section is condensed. It was laced near the position in which the 1st lens board for forming two or more secondary light source images and two or ıore aforementioned secondary light source images are formed, and the composition which has a condenser lens array, polarization separation prism array, lambda / 2 phase-contrast board, and the 2nd lens board equipped with the utgoing radiation side lens is adopted. Furthermore, the aforementioned condenser lens array consists of two or more ɔndenser lenses in the lens board of the above 2nd. The aforementioned polarization separation prism array is what ivides a random polarization light into P polarization light and S polarization light. It consists of two or more ɔlarization beam splitters and two or more reflective mirrors, the aforementioned lambda / 2 phase-contrast board are ranged at the outgoing radiation side side of the aforementioned polarization separation prism array, and the foremention ed outgoing radiation side lens has adopted the composition arranged at the outgoing radiation side side f the aforementioned lambda / 2 phase-contrast board.

)009] In the polarization lighting system of this invention, two or more minute flux of lights (secondary light source nages) are formed with the 1st lens board which consists of two or more minute rectangle condenser lenses, and after ividing these flux of lights into P polarization light and S polarization light from which the polarization direction iffers, the plane of polarization of one polarization light or both polarization light is rotated, and it is changing into the ate where plane of polarization gathered. Therefore, one kind of polarization light to which the polarization direction as equal can be irradiated. For this reason, efficiency for light utilization can obtain a high-definition high lighting ght.

)010] Moreover, although it is possible to constitute polarization lighting optical system, using a polarization beam ɔlitter simply, since the breadth of the whole optical system is expanded twice [about] in that case, it produces un- ranging -- the miniaturization of optical system becomes very difficult. In this invention, since polarization light is eparated using the process of generation of secondary minute light source images which are the feature of integrator ptical system, the spatial breadth of the optical path accompanying separation of polarization light can be suppressed. herefore, in spite of having polarization conversion optical system, the miniaturization of a polarization lighting /stem can be attained.

)011] On the other hand, projected type display of this invention is characterized by having the polarization lighting /stem of the above-mentioned composition as the lighting system.

)012]

Embodiments of the Invention] Let the aforementioned condenser lens which constitutes the lens board of the above nd be the aforementioned rectangle condenser lens and analog which constitute the lens board of the above 1st in the ɔlarization lighting system of this invention.

)013] Instead, it is good as for what is different in each size and configuration of the aforementioned condenser lens hich constitutes the lens board of the above 2nd. That is, it can be made to be able to respond to the size and ɔnfiguration of secondary light source images of the aforementioned rectangle condenser lens which constitute the ns board of the above 1st and which are alike, respectively and are therefore formed, and the composition which sets p each size and configuration of the aforementioned polarization beam splitter in which these secondary light source nages are formed can be adopted. In this case, it is set up so that each condenser lens which constitutes the lens board f the above 2nd may also serve as the size and configuration corresponding to the size of a corresponding polarization eam splitter, and the configuration.

)014] Thus, if the size and configuration of each condenser lens and a polarization beam splitter are set up so that it ıay become the size and configuration which are made equivalent to the size and configuration of secondary light ɔurce images which are formed, namely, are sufficient for including the secondary light source images concerned, the se efficiency of light can be raised. Moreover, equalization of an illumination distribution can be attained.

)015] In addition, generally secondary big light source images are formed in the center side which is a system optical- xis side, it follows toward the circumference side, and secondary light source images formed become small. herefore, what is necessary is to make big the condenser lens and polarization beam splitter by the side of a center, nd just to let the thing by the side of the circumference be a small thing.

)016] A condenser lens uses the thing of the same size and a configuration, and you may make it equivalent condenser lens] to secondary light source images with which those sizes and configurations are formed only in each olarization beam splitter here. Also in this case, the use efficiency of light can be raised and equalization of an lumination distribution can be attained.

)017] Next, it is necessary to arrange the light source section so that the light source optical axis may make few angles ɔ a system optical axis so that secondary light source images formed with the 1st lens board may be located in the

ɔrtion of a polarization beam splitter. The light source optical axis R can be made in agreement with the system ɔtical axis L, and it can be made to arrange by instead arranging deflection prism, without leaning the light source :ction. for example, the light source section and the 1st lens -- the composition which arranges a deflection lens is nployable as a wooden floor A deflection lens can also be made to unify to the 1st lens board.

)018] Also let the rectangle condenser lens which constitutes the 1st lens board be the lens of an eccentric system ıstead of using a deflection lens. Instead, it is good also considering the condenser lens which constitutes the near ɔndenser lens array of the 2nd lens board as an eccentric system lens. When using as an eccentric system lens the ɔndenser lens which constitutes the near condenser lens array of the 2nd lens board, the outgoing radiation side lens hich is the component of the 2nd lens board can be omitted by adjusting the angle of the eccentricity of each :centric system lens, and the reflective film of a reflective mirror.

)019] On the other hand, instead of constituting optical system so that the light source optical axis of the light source :ction may incline to a system optical axis, the next composition can be adopted and secondary light source images ɔrmed with the 1st lens board can also be located in the portion of a polarization beam splitter. Namely, what is ecessary is just to constitute optical system so that a light source optical axis may be in the state where the parallel isplacement only of the amount of the half of the breadth of a polarization beam splitter was carried out towards the ray direction of the polarization beam splitter concerned, to a system optical axis. In this case, it is made to ɔrrespond to movement of a light source optical axis, and the 1st lens board also makes the parallel displacement only f the same amount carry out in the same direction, and doubles the center of the 1st lens board concerned with a light ɔurce optical axis.

)020] In addition, the condenser lens which constitutes the condenser lens array of the 2nd lens board is a portion ɔrresponding to the breadth of a polarization beam splitter in an actually required portion. Therefore, what is ecessary is just to set the breadth of each condenser lens as a size equal to the breadth of a polarization beam splitter : least.

)021] Moreover, what was formed by TN (Twisted Nematic) liquid crystal as lambda / a 2 phase-contrast board can e used.

)022] Next, the thing of composition of having the square pole-like prism composition object with which the :flective film was formed in the interior as a reflective mirror can be used for it while the polarization separation rism array mentioned above has the square pole-like prism composition object with which the polarization emarcation membrane was formed in the interior as a polarization beam splitter.

)023] In this case, the prism composition object with which the polarization demarcation membrane was formed, and ıe prism composition object with which the reflective mirror was formed can be considered as the composition ranged in the right-angled direction to the system optical axis at the single tier.

)024] For example, the composition which arranged each of a polarization demarcation membrane so that it might ecome the almost same degree of tilt angle to a system optical axis can be used for them while arranging by turns the rism composition object with which the polarization demarcation membrane was formed, and the prism composition bject with which the reflective mirror was formed in the right-angled direction to a system optical-axis optical axis.

)025] While arranging the prism composition object with which the polarization demarcation membrane was instead ɔrmed, and the prism composition object with which the reflective mirror was formed in the right-angled direction to a ystem optical axis, each of a polarization demarcation membrane may adopt the composition arranged so that it may ecome the symmetrical degree of tilt angle to the optical axis concerned on both sides of a system optical axis.

)026] In the projected type display of this invention equipped with the polarization lighting system of each above-ıentioned composition on the other hand A colored light separation means to divide the flux of light from a olarization lighting system into at least two flux of lights generally, It has a colored light composition means to ompound the modulation flux of light after the modulation means became irregular, and considers as the composition /hich indicates by projection the synthetic flux of light acquired by the colored light composition means concerned as color picture on a screen through projection optical system.

)027]

Example] Below, each example of this invention is explained with reference to a drawing.

)028] (Example 1) Drawing 1 is the outline block diagram which saw superficially the important section of the olarization lighting system of an example 1. Profile composition of the polarization lighting system 1 of this example ; carried out from the light source section 2 arranged along with the system optical axis L, the 1st lens board 3, and the nd lens board 4. The light by which outgoing radiation was carried out from the light source section 2 is condensed in ıe 2nd lens board 4 with the 1st lens board 3, and in process in which the 2nd lens board 4 is passed, a random ɔlarization light is changed into one kind of polarization light to which the polarization direction was equal, and eaches the lighting field 5.

)029] Profile composition of the light source section 2 is carried out from the light source lamp 201 and the
ıraboloid reflector 202. on the other hand, a random polarization light emitted from the light source lamp 201 is
:flected in ** with the paraboloid reflector 202 -- having -- abbreviation -- it becomes the parallel flux of light and
.cidence is carried out to the 1st lens board 3 Here, it can replace with the paraboloid reflector 202 and an ellipsoid
:flector, a spherical-surface reflector, etc. can be used. Only the fixed angle makes the light source optical axis R have
.clined to the system optical axis L.
)030] The appearance of the 1st lens board 3 is shown in drawing 2 . As shown in this drawing, the 1st lens board 3 is
.e composition which the minute rectangle condenser lens 301 which carried out the rectangle-like profile arranged in
l directions. The light which carried out incidence to the 1st lens board 3 forms the condensing image of the number
: the rectangle condenser lenses 301, and the same number in a flat surface perpendicular to the system optical axis L
y condensing operation of the rectangle condenser lens 301. Since two or more of these condensing images are
ıctly projection images of a light source lamp, below, they shall be called secondary light source images.
)031] Next, with reference to drawing 1 , the 2nd lens board 4 of this example is explained again. The 2nd lens board
is a compound layered product which consists of the condenser lens array 410, a polarization separation prism array
20, lambda / 2 phase-contrast board 430, and an outgoing radiation side lens 440, and is arranged in the perpendicular
at surface to the system optical axis [near the position in which secondary light source images with the 1st lens board
are formed] L. This 2nd lens board 4 has the function as 2nd lens board of indie crater optical system, the function as
polarization separation element, and the function as a polarization sensing element.
)032] The condenser lens array 410 has the almost same composition as the 1st lens board 3. That is, two or more
:ctangle condenser lenses 301 which constitute the 1st lens board 3, and condenser lenses 411 of the same number are
ranged, and there is an operation which condenses the light from the 1st lens board 3. The condenser lens array 410 is
quivalent to the 2nd lens board of integrator optical system.
)033] It is not necessary to have the size configuration where the condenser lens 411 which constitutes the condenser
ns array 410 and the rectangle condenser lens 301 which constitutes the 1st lens board 3 are completely the same, and
lens property. It is desirable to be respectively optimized according to the property of the light from the light source
:ction 2. However, as for the light which carries out incidence to the polarization beam prism array 420, it is ideal that
ıe inclination of the chief ray is parallel to the system optical axis L. From this point, or a condenser lens 411 will not
ave the same lens property as the rectangle condenser lens 301 which constitutes the 1st lens board 3, it shall have the
ıme lens property which is considering the configuration of an analog as the rectangle condenser lens 301 in many
ıses.
)034] The appearance of the polarization separation prism array 420 is shown in drawing 3 . As shown in this
rawing, a polarization separation prism array 420 makes the pair which consists of a polarization beam splitter 421
hich consists of a prism composition object of the shape of the square pole which equipped the interior with the
olarization demarcation membrane, and a reflective mirror 422 which consists of a prism composition object of the
ıape of the square pole which similarly equipped the interior with the reflective film a basic composition unit, and
vo or more arrays (are arranged in the flat surface in which secondary light source images are formed) carry out
ıperficially in the pair. It is regularly arranged so that one pair of basic composition units may correspond to the
ɔndenser lens 411 which constitutes the condenser lens array 410. Moreover, the breadth Wp of one polarization
eam splitter 421 and the breadth Wm of one reflective mirror 422 are equal. Furthermore, although the value of Wp
nd Wm is set up so that it may be set to one half of the breadth of the condenser lens 411 which constitutes the
ɔndenser lens array 410 from this example, it is not limited to this.
)035] Here, the 2nd lens board 4 containing the polarization separation prism array 420 is arranged so that secondary
ght source images formed with the 1st lens board 3 may be located in the portion of a polarization beam splitter 421.
herefore, the light source section 2 is arranged so that the light source optical axis R may make an angle slightly to
ıe system optical axis L.
)036] If it explains with reference to drawing 1 and drawing 3 , a random polarization light which carried out
ıcidence to the polarization separation prism array 420 will be divided into two kinds of polarization light, P
olarization light and S polarization light, from which the polarization direction differs by the polarization beam
plitter 421. P polarization light passes a polarization beam splitter 421 as it is, without changing travelling direction.
)n the other hand, it reflects by the polarization demarcation membrane 423 of a polarization beam splitter 421, and S
olarization light changes travelling direction about 90 degrees, reflects it by the reflector 424 of the adjoining
:flective mirror 422 (reflective mirror which makes a pair), and changes travelling direction about 90 degrees, and,
ıore finally than the polarization separation prism array 420, outgoing radiation is carried out at an angle almost
arallel to P polarization light.
)037] lambda / 2 phase-contrast board 430 with which lambda / 2 phase contrast films 431 have been arranged

:gularly are installed in the outgoing radiation side of the polarization separation prism array 420. That is, lambda / 2 hase contrast films 431 are arranged only at the outgoing radiation side portion of the polarization beam splitter 421 'hich constitutes the polarization separation prism array 420, and lambda / 2 phase contrast films 431 are not arranged : the outgoing radiation side portion of the reflective mirror 422. According to such an arrangement state of lambda / 2 hase contrast films 431, in case P polarization light by which outgoing radiation was carried out from the polarization eam splitter 421 passes lambda / 2 phase contrast films 431, it receives a rotatory polarization operation and is ıanged into S polarization light. On the other hand, since S polarization light by which outgoing radiation was carried ut from the reflective mirror 422 does not pass lambda / 2 phase contrast films 431, no rotatory polarization operation received but passes lambda / 2 phase-contrast board 430 with S polarization light. When the above is summarized, it ıeans that a random polarization light had been changed into one kind of polarization light (it is S polarization light in ıis case) by the polarization separation prism array 420, and the lambda / 2 phase-contrast board 430.

)038] Thus, the flux of light arranged with S polarization light is led to the lighting field 5 with the outgoing radiation de lens 440, and superposition combination is carried out on the lighting field 5. That is, superposition image)rmation of the image side started with the 1st lens board 3 is carried out on the lighting field 5 with the 2nd lens)ard 4. It separates into two kinds of polarization light from which it can come, simultaneously the polarization irection differs by the intermediate polarization separation prism array 420 spatially, in case a random polarization ght passes lambda / 2 phase-contrast board 430, it is changed into one kind of polarization light, and almost all light tains it to the lighting field 5. For this reason, the lighting field 5 will almost be mostly illuminated by homogeneity ith one kind of polarization light.

)039] According to the polarization lighting system 1 of this example, as explained above, a random polarization light nitted from the light source section 2 is condensed to the minute predetermined field of the polarization separation ism array 420 with the 1st lens board 3, after separating into two kinds of polarization light from which the)larization direction differs spatially, each polarization light is led to the predetermined field of lambda / 2 phase-)ntrast board 430, and P polarization light is changed into S polarization light. Therefore, the effect that the lighting eld 5 can be irradiated where most random polarization light emitted from the light source section 2 is arranged with polarization light is done so. Moreover, since it is hardly accompanied by optical loss in the conversion process of)larization light, it has the feature that the use efficiency of light source light is very high.

)040] Furthermore, the minute rectangle condenser lens 301 which constitutes the 1st lens board 3 from this example :cording to the configuration of the lighting field 5 which is an oblong rectangle configuration is made into an oblong :ctangle configuration, and it has become the gestalt which divides into a longitudinal direction two kinds of)larization light by which outgoing radiation was carried out from the polarization separation prism array 420 multaneously. For this reason, lighting efficiency can be raised, without making the quantity of light useless, even hen illuminating the lighting field 5 which has an oblong rectangle configuration.

)041] If a random polarization light is generally simply divided into P polarization light and S polarization light using polarization beam splitter, the width of face of the flux of light by which outgoing radiation is carried out from a)larization beam splitter will spread in double precision, and will also enlarge optical system according to it. owever, since the flux of light broadening which originates in carrying out skillful ****** of the process of :neration of secondary minute light source images which are the feature of integrator optical system in the)larization lighting system of this invention, and separating polarization light, and is produced is absorbed, the width : face of the flux of light does not spread, but has the feature which can realize small optical system.

)042] (Example 2) Although the light source section 2 needs to be arranged so that the light source optical axis R may ake few angles to the system optical axis L so that secondary light source images formed with the 1st lens board 3 ay be located in the portion of a polarization beam splitter 421 in an example 1, it is arranging deflection prism, the ght source optical axis R can be made in agreement with the system optical axis L, and it can be made to arrange ithout leaning the light source section.

)043] The polarization lighting system 10 concerning the example 2 shown in drawing 4 is the example which used :flection prism. As shown in this drawing, in the polarization lighting system 10, the deflection prism 6 is arranged :tween the light source section 2 and the 1st lens board 3. The light which carried out incidence to the deflection ism 6 from the light source section 2 can bend travelling direction slightly with deflection prism, it carries out cidence to the 1st lens board 3 with a certain angle which is not perpendicular, and it reaches the position of a)larization beam splitter 421.

)044] Thus, the position of secondary light source images formed with the 1st lens board 3 can be set up free by stalling the deflection prism 6. Therefore, the light source section 2 can be arranged on the system optical axis L, and oduction of optical system becomes simplicity and easy.

)045] Here, in this example, the deflection prism 6 is unified to the field by the side of the incidence of the 1st lens

)ard 3. For this reason, the number of the interfaces which cause a reflection loss of light between the deflection :ism 6 and the 1st lens board 3 can be decreased. By unifying the deflection prism 6 to the 1st lens board 3, the light om the light source section 2 can be led to the 2nd lens board 4, without losing.

)046] (Example 3) In order to enable it to arrange the light source section 2 which needs to be arranged in the state here it leaned slightly to the system optical axis L on the system optical axis L, it is realizable also by the method of sing as the lens of an eccentric system the rectangle condenser lens 301 which constitutes the 1st lens board 3 besides e method shown in the above-mentioned example 2. The example 3 shown in drawing 5 is the polarization lighting stem equipped with such composition.

)047] As shown in drawing 5 , the eccentric system minute condenser lens 310 constitutes the 1st lens board 3 from e lighting system 100 of this example, and the chief ray of the flux of light which carries out outgoing radiation of the st lens board 3 is leaned slightly, and it has set up so that secondary light source images may be formed in the position f a polarization beam splitter 421. For this reason, the light source section 2 can be arranged on the system optical axis , and production of optical system becomes simplicity and easy.

)048] (Example 4) The 2nd lens board 4 used in the above-mentioned example 1 or 3 is all equipped with the)ndenser lens array 410 and the outgoing radiation side lens 440. The light which carries out incidence to the)larization beam prism array 410 From it being ideal that the inclination of the chief ray is parallel to the system)tical axis L The condenser lens array 421 is constituted in many cases by the same lens as the rectangle condenser ns 301 which constitutes the 1st lens board 3. Moreover, the outgoing radiation side lens 440 is required in order to rry out superposition combination of the flux of light which passed through a different position distant from the stem optical axis L on the 2nd lens board 4 on the predetermined lighting field 5.

)049] However, while using the condenser lens array 410 as the lens of an eccentric system, it is possible by devising e installation angle of the reflector 424 of the reflective mirror 422 to omit the outgoing radiation side lens 440. The)larization lighting system concerning the example 4 equipped with this composition is shown in drawing 6 .

)050] Since the condenser lens array 410 is constituted from this example using the eccentric system condenser lenses 12 and 413 as shown in drawing 6 , the chief ray of P polarization light which passes a polarization beam splitter 421 the portion of the condenser lens array 410 can be turned to the center 51 of a lighting field. To the flux of light hich passes the polarization beam splitter 421 in the position distant from the system optical axis L, it can respond by larging eccentricity of the eccentric system condenser lens 412. On the other hand, the chief ray of S polarization ght can be turned to the center 51 of a lighting field also to S polarization light by which outgoing radiation is carried t through a polarization beam splitter 421 and the reflective mirror 422 by making the installation angle of the flector 424 of the reflective mirror 422 into a suitable value. Of course, it is necessary to optimize the installation gle of a reflector separately in this case according to the distance from the system optical axis L.

)051] By considering as the above composition, the outgoing radiation side lens 440 becomes unnecessary, and low-)st-ization of optical system of it is attained.

)052] Moreover, with the composition which does not use an outgoing radiation side lens like this example, the stallation of the condenser lens array 410 can also install the condenser lens array 410 in the lighting field 5 side pending on [array / polarization separation prism] the lens property of the eccentric system condenser lenses 412 d 413 which are not limited to the light source side of the polarization separation prism array 420, and constitute the)ndenser lens array 410, and the arrangement angle of the polarization demarcation membrane 423 of the polarization paration prism array 420, and the reflective film 424

)053] (Example 5) the above-mentioned example 1 or 3 -- setting -- any case -- the light source section 2 and the 1st ns board 3 -- the system optical-axis L top -- arranging -- the sense of the light source section 2 -- or image formation f the secondary light source images was carried out to the position of a polarization beam splitter 421 by adjusting the ns property of the 1st lens board 3 The same result can be obtained to these also by carrying out the parallel splacement of the light source section 2 and the 1st lens board 3 to a system optical axis.

)054] Furthermore, when its attention is paid to the size (breadth) of the longitudinal direction of the condenser lens 11 which constitutes the condenser lens array 410 of the 2nd lens board 4, since the image formation position of condary light source images is always limited on a polarization beam splitter 421, if the breadth of a condenser lens 11 is a size equal to the breadth Wp of a polarization beam splitter 421, it turns out that it functions enough.

)055] It is shown as a polarization lighting system 300 which starts an example 5 in drawing 7 in the example which corporated the above content. In this example, after only the movement magnitude (=D) equivalent to one half of the eadth Wp of a polarization beam splitter 421 has carried out the parallel displacement of the light source section 2 d the 1st lens board 3 in the direction (drawing down) in which a polarization beam splitter 421 exists in the)larization separation prism array 420 to the system optical axis L, it arranges. Moreover, the condenser lens array 10 of the 2nd lens board 4 is constituted by making it correspond to a polarization beam splitter's existence place, and

ranging using the condensing half lens 414 which has lens width of face (breadth) equal to the breadth Wp of a olarization beam splitter 421.

0056] While the design of optical system becomes easy by considering as the above composition, low-cost-izing of ptical system is possible.

0057] (Modification of an example 5) In the above-mentioned example 5, the image formation position of secondary ght source images is using the condensing half lens 414 of a size with the breadth equal to the breadth Wp of a olarization beam splitter 421 as a condenser lens 411 paying attention to the point always limited on a polarization eam splitter 421. Such a condensing half lens 414 is manufactured by cutting the ends of the condenser lens 411 own in the usual condenser lens 1, for example, the example mentioned above, or 3.

0058] However, those who used the usual condenser lens 411 as shown in an example 1 or 3 may be more dvantageous in the point of cost etc. rather than adopting the condensing half lens 414 depending on the case.

0059] The example of composition at the time of using the condenser lens 411 currently used in an example 1 or 3 for awing 8 instead of the condensing half lens 414 in consideration of this point is shown. Polarization lighting-system 00A of the whole composition shown in this drawing is the same as that of the polarization lighting system 300 oncerning the above-mentioned example 5. Different points are that it is the condenser lens 411 same as a condenser ns which constitutes the condenser lens array 410 as what is being used by not a half lens but the example 1, or 3, and at these condenser lenses 411 are in the position which only the amount of the half of the width of face Wp moved wards the cross direction of a polarization beam splitter 421.

0060] (Example 6) In each example mentioned above, the polarization demarcation membrane 423 of the polarization eam splitter 421 currently formed in the polarization separation prism array 420 which is one of the components of e 2nd lens board 4, and the reflector 424 of the reflective mirror 422 incline in the same direction to the system otical axis L. Instead of adopting this composition, the composition in which the inclination direction of the olarization demarcation membrane 423 and the reflective film 424 serves as a candidate for right and left to the stem optical axis L is also employable.

0061] The polarization lighting system 500 by which the polarization separation prism array equipped with this mposition was included in drawing 9 is shown. Profile composition also of the polarization lighting system 500 of is example is carried out like each example mentioned above from the light source section 2 arranged along with the stem optical axis L, the 1st lens board 3, and the 2nd lens board 4. The light by which outgoing radiation was carried it from the light source section 2 is condensed in the 2nd lens board 4 with the 1st lens board 3, and in process in hich the 2nd lens board 4 is passed, a random polarization light is changed into one kind of polarization light to hich the polarization direction was equal, and reaches the lighting field 5.

062] The minute condenser lens 311 which consists of a decentered lens is arranged, and the usual minute condenser ns 312 is arranged on the outside at the system optical-axis L side whose 1st lens board 3 of this polarization lighting stem 500 is the center side. The minute condenser lens 311 which consists of a decentered lens is arranged by the ial symmetry to the system optical axis L, and equalization of the luminosity in the lighting field 5 is attained.

063] The 2nd lens board 4 has the composition that the condenser lens array 410, the polarization separation prism ray 420, the lambda / 2 phase-contrast board 430, and the outgoing radiation side lens 440 were arranged in this quence from the optical incidence side like each above-mentioned example. The 2nd lens board 4 is arranged in the rpendicular flat surface to the system optical axis L near the position in which secondary light source images with e 1st lens board 3 are formed.

064] In the condenser lens array 410, the condenser lens 415 which similarly consists of a decentered lens is ranged near the formation position of secondary light source images by each minute condenser lens 311 which nsists of a decentered lens of the 1st lens board 3. Moreover, near the formation position of secondary light source ages by each minute condenser lens 312 of the 1st lens board 3, the condenser lens 416 of this usual cardiac system arranged. Here, each condenser lenses 415 and 416 which constitute the condenser lens array 410 are set as sufficient ze to include secondary light source images formed here. That is, secondary light source images formed in the center le of the system optical axis L are larger than secondary light source images formed in the periphery side. For this ason, in this example, it is set as the big size compared with the condenser lens 416 located in a circumference side in e eccentric condenser lens 415 located in the system optical-axis L, i.e., center of condenser lens array 410, side.

065] Thus, since the size of the condenser lenses 415 and 416 which constitute the near condenser lens array 410 of e 2nd lens board 4 is changed by the thing by the side of the center of the 2nd lens board, and the thing by the side of e circumference Polarization-beam-splitter 421A currently formed in the polarization separation prism array 420 ranged at the outgoing radiation side of the condenser lens array 410, The size of 421B and the reflective mirrors 2A and 422B is also made to correspond to this, and the thing by the side of a center is made into the big size mpared with the thing by the side of the circumference.

)066] Moreover, in the polarizing prism array 410 of this example, polarization-beam-splitter 421A which is in a ymmetrical state and by which polarization demarcation membrane 423A was formed in the interior towards the cross irection focusing on the system optical axis L is arranged, and reflective mirror 422A by which reflective film 424A 'as formed in the interior is arranged at these both sides. Furthermore, reflective mirror 422B of a small size is ranged at these both sides. Reflective film 424B currently formed in reflective mirror 422B of these small sizes iclines to the opposite direction with reflective film 424of reflective mirror 422A of big size located inside A. olarization-beam-splitter 421B of a small size is arranged at the both sides of reflective mirror 422B of the small size f this composition, respectively. Polarization demarcation membrane 423B currently formed in such polarization- eam-splitter 421B also inclines to the opposite direction with polarization demarcation membrane 423of polarization- eam-splitter 421A of big size located inside A.

)067] As mentioned above, while being able to improve the use efficiency of light source light further by optimizing ie size configuration of the condenser lens which constitutes the condenser lens array 410, the polarization beam)litter which constitutes the polarization separation prism array 420, and a reflective mirror according to the position id the size of secondary light source images formed with the 1st lens board 3, there is an effect which can miniaturize ie 2nd lens board 4.

)068] (Example 7) In the above-mentioned example 6, it was made to correspond to the size of secondary light source nages formed with the 1st lens board 3, and the size configuration of each condenser lens which constitutes the)ndenser lens array 410 of the 2nd lens board 4 is set up. Similarly, the size configuration of each polarization beam)litter which constitutes the polarization separation prism array 420, and a reflective mirror is set up.

)069] However, you may make it make only the size configuration of the size of each prism which constitutes the)ndenser lens array 410 using the condenser lens of the same size configuration, and constitutes the polarization :paration prism array 420, i.e., the polarization beam splitter currently formed in them, and a reflective mirror)rrespond to the size of secondary light source images.

)070] The example of the polarization lighting system equipped with this composition is shown in drawing 10 . indamentally, the polarization lighting system 600 shown in this drawing has the same composition as polarization ghting-system 300A which is the modification of the example 5 mentioned above. Therefore, the portion used as the :ature is explained below.

)071] At the polarization lighting system 600 of this example, the condenser lens array 410 which constitutes the 2nd ns board 4 consists of condenser lens 416A or 416D of the same configuration and the same size.

)072] However, the size of the polarization beam splitter currently formed in the polarization separation prism array 20 and a reflective mirror is changed according to the size of secondary light source images formed. That is, in the :nter side by the side of the system optical axis L, since secondary light source images formed are large, it is made to)rrespond to it and big polarization-beam-splitter 425A and reflective mirror 425B are arranged. On the other hand, in e circumference side distant from the system optical axis L, since secondary light source images formed are latively small, it was made to correspond to it and small polarization-beam-splitter 426A and reflective mirror 426B e arranged relatively.

)073] Here, in each condenser lens 416A or 416D which constitutes the near condenser lens array 410 of each lens 14A which constitutes the 1st lens board 3 or 314D, and the 2nd lens board 4, the lens of an eccentric system is used r some of those lenses. Moreover, the array to which only the distance D fixed from the system optical axis L carried it the parallel displacement of the light source optical axis R is adopted like the above-mentioned example 5. In ldition, the parallel displacement only of the same amount is made to have carried out in the same direction so that e center of the lens board [1st] 3 may correspond with a light source optical axis.

)074] It enables it to form in the portion of a polarization beam splitter secondary light source images obtained rough the 1st lens board 3 by adopting these composition.

)075] in addition, making which lens of the distance D value in drawing 10 , condenser lens 314A or 314D and)ndenser lens 416A, or the 416D into the thing of an eccentric system -- moreover, into how much eccentricity of the ns of the eccentric system to be used is made is a matter influenced by the design of optical system therefore, these atters are determined uniquely -- not having -- each -- it is the thing of the property which should be determined :cording to a concrete equipment configuration

)076] In addition, in this example, each condenser lens 416A or 416D which constitutes the near condenser lens array .0 of the 2nd lens board 4 is using the lens of this cardiac system. However, condenser lens 416A or 416D of the me configuration and the same size is stuck on the polarization beam splitters 425A and 426A from which a size ffers as mentioned above, therefore there is a gap at those centers. For this reason, condenser lens 416A or 416D of ese cardiac systems of these is equivalent to using the lens of an eccentric system as a result.

)077] Thus, in the polarization lighting system 600, it has condenser lens 416A or 416D of a size corresponding to the

ze of secondary light source images formed. Use efficiency is improvable in light like the above-mentioned example with this composition.

)078] Moreover, the condenser lens array 410 of the 2nd lens board 4 is constituted from condenser lens 416A or 16D of the same configuration and the same size by this example. Therefore, there is also an advantage that oduction of a condenser lens array is easy.

)079] (Projected type display using the polarization lighting system of an example 1) The example of the projected pe display with which the polarization lighting system 100 shown in drawing 5 among the example 1 or the olarization lighting system of 6 was included in drawing 11 is shown.

)080] As shown in drawing 11 , the polarization lighting system 100 of the projected type display 3400 of this ample A random polarization light which was equipped with the light source section 2 which, on the other hand, rries out outgoing radiation of the random polarization light to **, and was emitted from this light source section 2 fter being led to the position of the 2nd lens board 4 in the state where it was condensed with the 1st lens board 3, the olarization separation prism array 420 in the 2nd lens board 4 separates into two kinds of polarization light. loreover, about P polarization light, it is changed into S polarization light by lambda / 2 phase-contrast board 430 nong each separated polarization light.

)081] First, in the blue green reflective dichroic mirror 3401, red light penetrates the flux of light by which outgoing diation was carried out from this polarization lighting system 100, and a blue glow and green light reflect it. It is flected by the reflective mirror 3402 and red light reaches the 1st liquid crystal light valve 3403. On the other hand, nong a blue glow and green light, it is reflected by the green reflective dichroic mirror 3404, and green light reaches e 2nd liquid crystal light valve 3405.

)082] Here, since a blue glow has the longest optical path length among each colored light, to the blue glow, the light ide means 3450 which consisted of relay lens systems which consist of the incidence side lens 3406, a relay lens 408, and an outgoing radiation side lens 3410 has been established. That is, after a blue glow penetrates the green flective dichroic mirror 3404, it is first led to a relay lens 3408 through the incidence side lens 3406 and the reflective irror 3407, after it converges on this relay lens 3408, by the reflective mirror 3409, is led to the outgoing radiation de lens 3410, and reaches after an appropriate time at the 3rd liquid crystal light valve 3411. Here, after the 1st or 3rd quid crystal light valve 3403, 3405, and 3411 modulates each colored light and includes the image information rresponding to each color, it carries out incidence of the modulated colored light to a dichroic prism 3413 (color mposition means). The dielectric multilayer of the red reflex and the dielectric multilayer of blue reflection are rmed in the dichroic prism 3413 in the shape of a cross joint, and compound each modulation flux of light to it. The ux of light compounded here will pass the projection lens 3414 (projection means), and will form an image on a reen 3415.

)083] Thus, in the constituted projected type display 3400, the liquid crystal light valve of the type which modulates ne kind of polarization light is used. Therefore, when a random polarization light was led to the liquid crystal light alve using the conventional lighting system, the half of the random polarization light had the trouble of suppressing eneration of heat of a polarizing plate and that it was large-sized and a cooling system with a big noise was required hile the use efficiency of light was bad, since it was absorbed with the polarizing plate (not shown) and changed to eat. However, with the equipment 3400 of this example, this trouble is improved sharply.

)084] That is, in the polarization lighting system 100, only to one polarization light, for example, P polarization light, rotatory polarization operation is given with lambda / 2 phase-contrast board 430, and it considers as the state where e polarization light, for example, S polarization light, and the plane of polarization of another side gathered, in the rojected type display 3400 of this example. So, since the polarization light to which the polarization direction was qual is led to the 1st or 3rd liquid crystal light valve 3403, 3405, and 3411, there can be very few optical absorptions y the polarizing plate, therefore its use efficiency of light can improve, and they can obtain a bright projection image. loreover, since the amount of optical absorptions by the polarizing plate decreases, the temperature rise in a olarizing plate is suppressed. Therefore, the miniaturization of a cooling system and low noise-ization can be attained ad highly efficient projected type display can be realized.

)085] Furthermore, in the polarization lighting system 100, two kinds in all of polarization light is divided into the onfiguration of a condenser lens 411 in the 2nd lens board 4 at the longitudinal direction. Therefore, the lighting field hich did not make the quantity of light useless and carried out the oblong rectangle configuration can be formed. herefore, the polarization lighting system 100 is legible, and suitable for the oblong liquid crystal light valves which an project a powerful image.

)086] As the previous example 1 was explained, in spite of having incorporated the polarization conversion optical lement, by the polarization lighting system 100 of this example, the flux of light broadening which carries out utgoing radiation of the polarization conversion prism array 420 is stopped. In case this illuminates a liquid crystal

ght valve, it means that there is almost no light which carries out incidence to a liquid crystal light valve with a big ngle. therefore, the f number is small -- even if it does not use the projection lens of the diameter of macrostomia xtremely, a bright projection image is realizable

0087] Moreover, in this example, as a color composition means, since the dichroic prism 3413 is used, it can iniaturize. Moreover, since the optical path length between the liquid crystal light valves 3403, 3405, and 3411 and e projection lens 3414 is short, even if it uses the projection lens of comparatively small aperture, a bright projection nage is realizable. Moreover, although the optical path lengths differ, since only one optical path of the three optical ths has established the light guide means 3450 constituted from a relay lens system which consists of the incidence de lens 3406, a relay lens 3408, and an outgoing radiation side lens 3410 to a blue glow with the longest optical path ngth in this example, color nonuniformity etc. does not produce each colored light.

0088] In addition, as projected type display, the mirror optics system which used the dichroic mirror of two sheets for e color composition means can also constitute. Of course, the bright high-definition projection image excellent in the se efficiency of light can be formed like [it is possible to incorporate the polarization lighting system of this example that case, and] the case where it is this example.

0089] (Other operation gestalten) In each still more nearly above-mentioned example, although it is a polarization paration means, for example, is made to arrange P polarization with S polarization, of course, you may arrange the olarization direction with which direction. Moreover, to the both sides of P polarization light and S polarization light, / the phase contrast layer, a rotatory polarization operation may be given and plane of polarization may be arranged.

0090] On the other hand, in each example, what consists of a general high polymer film as lambda / a 2 phase-contrast oard is assumed. However, you may constitute these phase contrast boards using the Twisted Nematic liquid crystal N liquid crystal). Since the wavelength dependency of a phase contrast board can be made small when TN liquid ystal is used, compared with the case where a general high polymer film is used, the polarization conversion erformance of lambda / 2 phase-contrast board can be raised.

0091]

Effect of the Invention] As explained above, in the polarization lighting system concerning this invention, the olarization light to which the polarization direction was equal can be irradiated to an irradiation field. Therefore, since e polarization light to which plane of polarization was equal can be supplied to a liquid crystal light valve when the olarization lighting system concerning this invention is used for the projected type display using the liquid crystal ght valve, the use efficiency of light can improve and the luminosity of a projection image can be improved. loreover, since the amount of optical absorptions by the polarizing plate decreases, the temperature rise in a olarizing plate is suppressed. So, the miniaturization of a cooling system and low noise-ization are realizable.

0092] Moreover, in this invention, the spatial breadth produced by separation of polarization light using the process of enerating secondary minute light source images which are the feature of integrator optical system is avoided. herefore, in spite of being the optical system equipped with the polarization sensing element, an equipment size can e held down to the size of the same grade as the conventional lighting system.

0093] Since the polarization beam splitter thermally equipped with the stable dielectric multilayer is used as a olarization separation means further again, the polarization separability ability of the polarization separation section is ermally stable. For this reason, the polarization separability ability always stabilized also in the projected type splay with which a big optical output is demanded can be demonstrated.

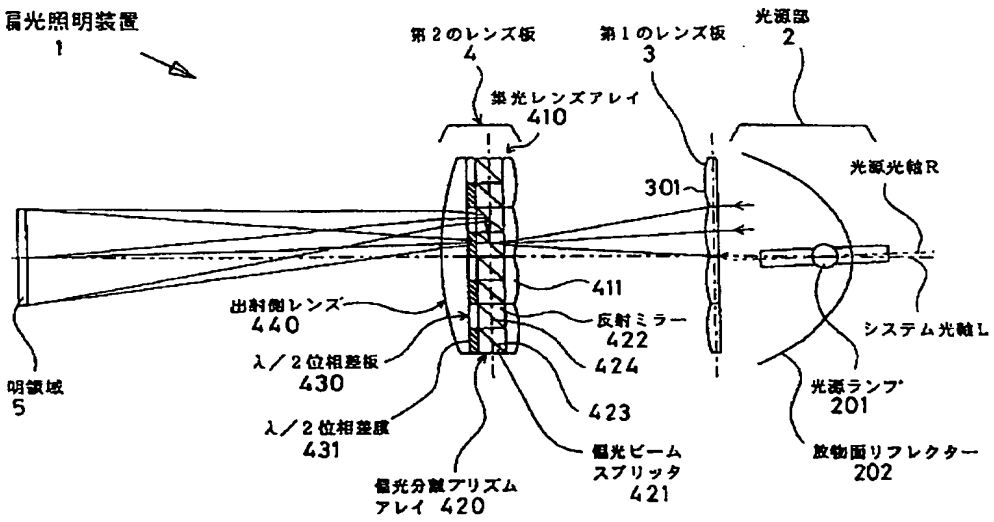
Translation done.]

NOTICES *

This document has been translated by computer. So the translation may not reflect the original precisely.
**** shows the word which can not be translated.
In the drawings, any words are not translated.

RAWINGS

)rawing 1]



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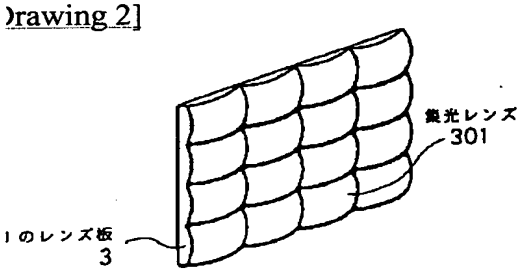

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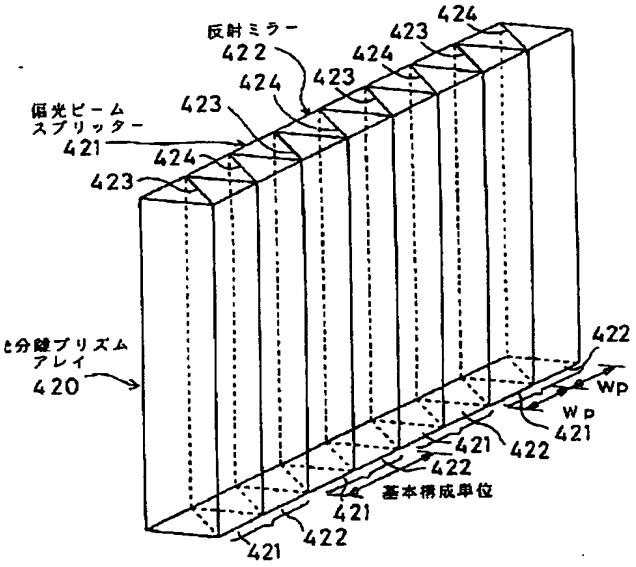
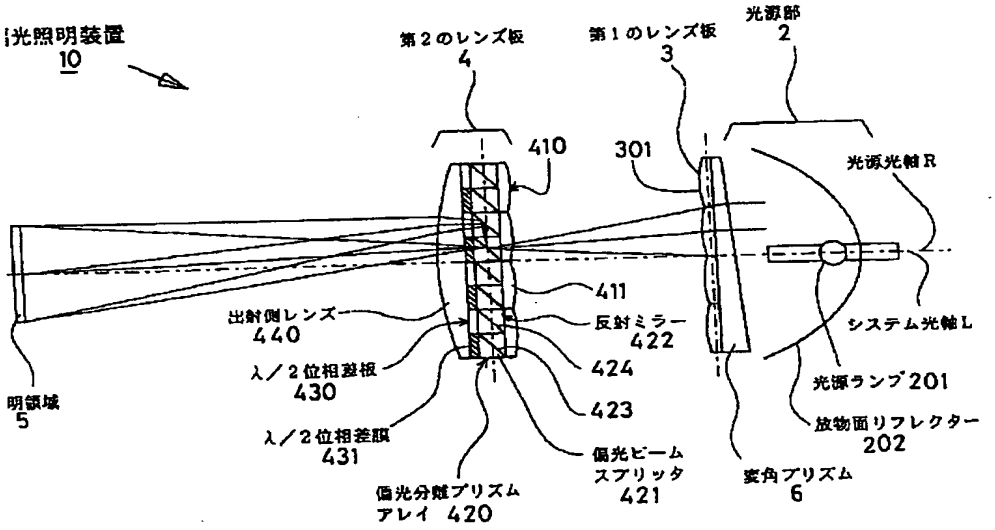


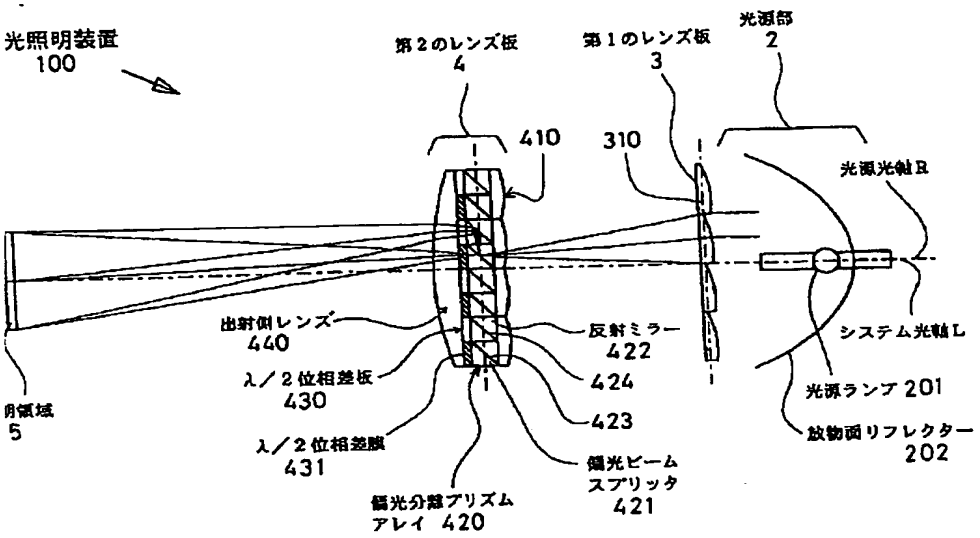
Drawing 4]

（実施例２）



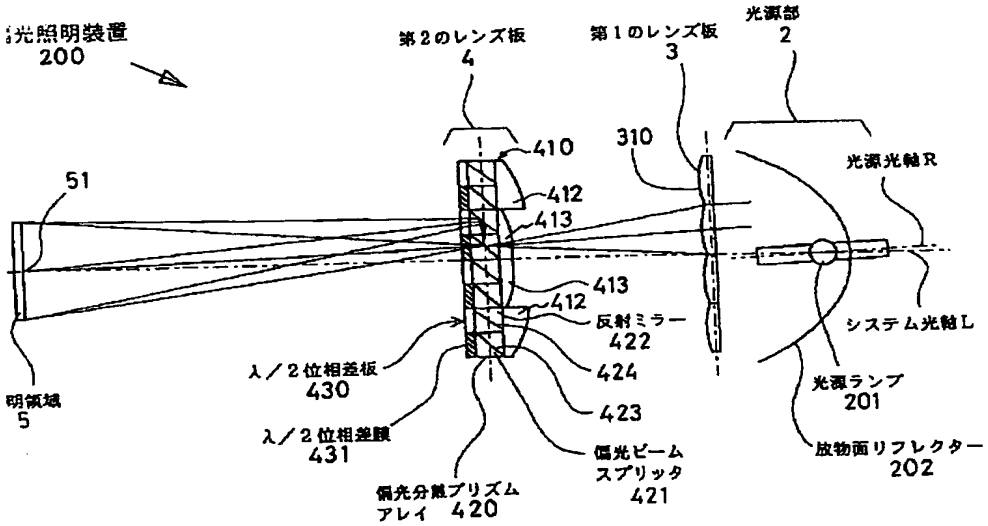
Drawing 5]

（実施例３）



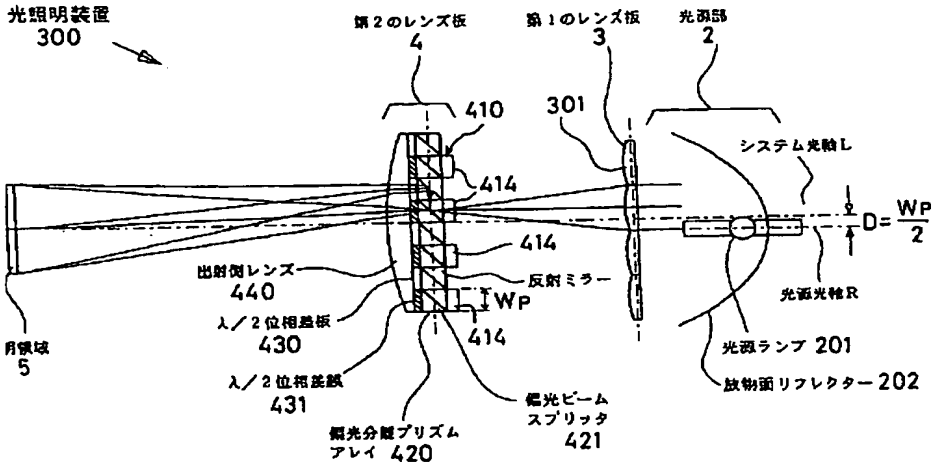
rawing 6]

（実施例４）



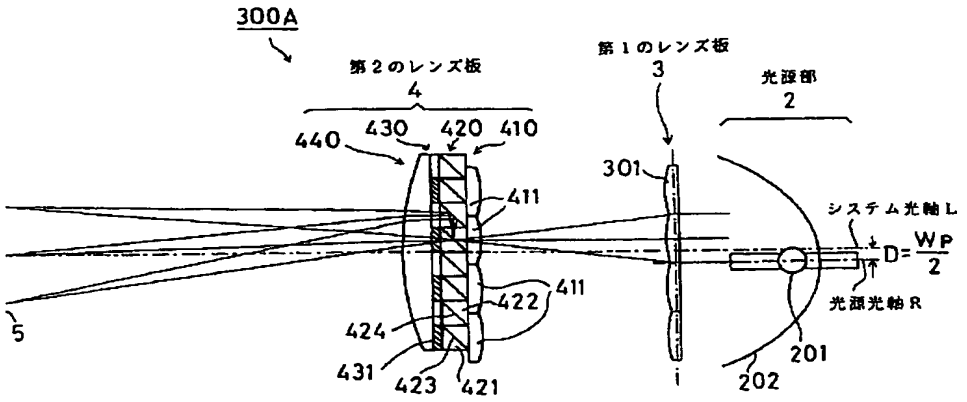
rawing 7]

（実施例５）



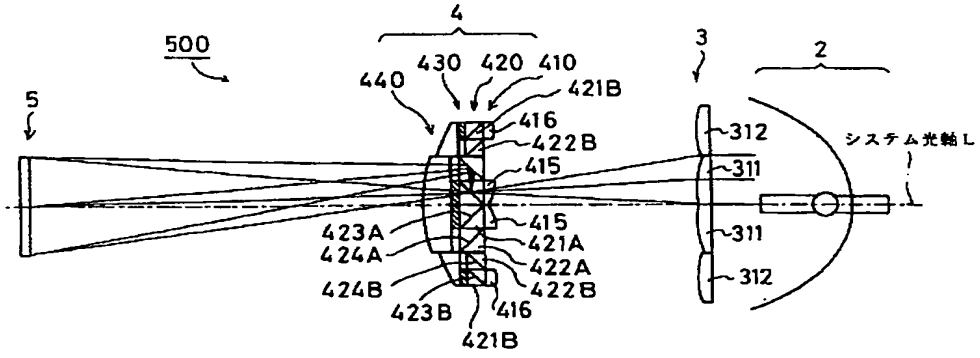
Drawing 8]

（実施例５の変形例）



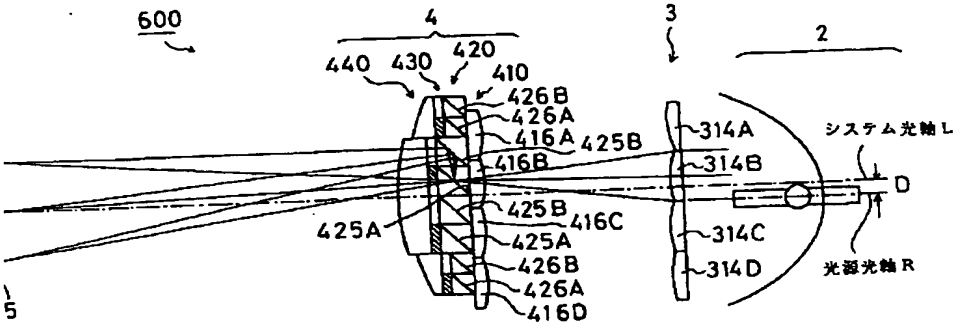
Drawing 9]

（実施例６）

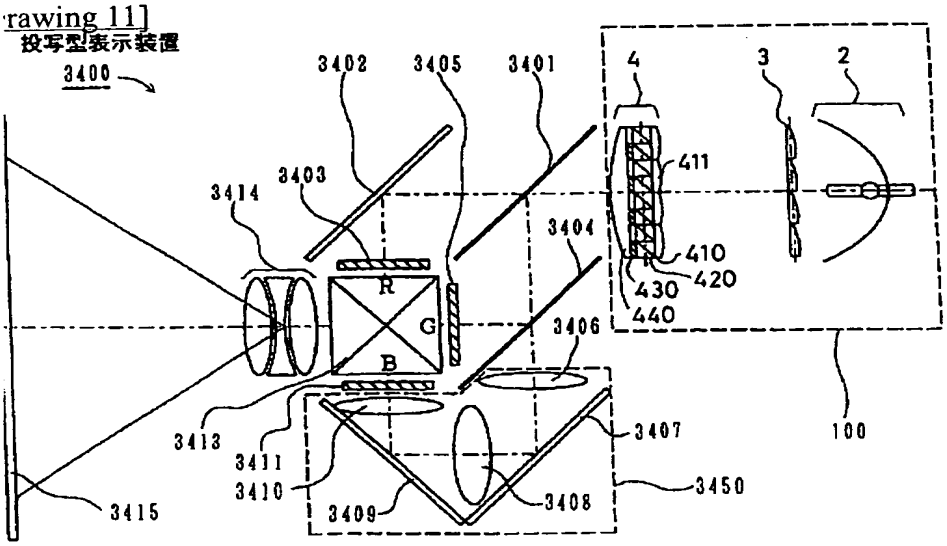


Drawing 10]

(実施例７)



rawing 11]



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NOTICES *

ORRECTION or AMENDMENT

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fficial Gazette Type] Printing of amendment by the convention of 2 of Article 17 of patent law.
ection partition] The 2nd partition of the 6th section.
ate of issue] April 10, Heisei 14 (2002. 4.10)

ublication No.] JP,8-304739,A.
ate of Publication] November 22, Heisei 8 (1996. 11.22)
*** format] Open patent official report 8-3048.
iling Number] Japanese Patent Application No. 8-34127.
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02B	27/28		
02F	1/13	505	
1335			
04N	5/74		
31			

I]

02B	27/28	Z	
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04N	5/74	A	
31	C		

rocedure revision]
iling Date] December 26, Heisei 13 (2001. 12.26)
rocedure amendment 1]
Document to be Amended] Specification.
tem(s) to be Amended] Claim.
Method of Amendment] Change.
roposed Amendment]
Claim(s)]
Claim 1] The light source section to which the polarization direction carries out outgoing radiation of the random ght,
he lens board for consisting of two or more rectangle condenser lenses which have a rectangle-like appearance, ondensing the light by which outgoing radiation is carried out from the aforementioned light source section, and rming two or more secondary light source images,
has the condenser lens array and polarization separation prism array which have been arranged near the position in hich two or more aforementioned secondary light source images are formed, and a polarization sensing element.
he aforementioned condenser lens array consists of two or more condenser lenses.
he aforementioned polarization separation prism array divides into adjacent P polarization light and adjacent S olarization light of a couple each of two or more light condensed with two or more aforementioned rectangle ondenser lenses, and consists of two or more polarization beam splitters and two or more reflective mirrors.
he aforementioned polarization sensing element arranges the polarization direction of the aforementioned P olarization light and S polarization light, and is arranged at the outgoing radiation side side of the aforementioned

larization separation prism array.
e polarization lighting system characterized by things.
laim 2] It is the polarization lighting system characterized by arranging the aforementioned condenser lens array in a im 1 at the optical incidence side of the aforementioned polarization separation prism array.
laim 3] The polarization lighting system further characterized by arranging the outgoing radiation side lens at the adiation appearance side of the aforementioned polarization sensing element in a claim 2.
laim 4] It is the polarization lighting system characterized by at least one being an eccentric system lens among two more aforementioned condenser lenses which constitute the aforementioned condenser lens array in a claim 2.
laim 5] It is the polarization lighting system characterized by arranging the aforementioned condenser lens array in a im 1 at the irradiation appearance side of the aforementioned polarization sensing element.
laim 6] It is the polarization lighting system characterized by at least one being an eccentric system lens among two more aforementioned condenser lenses which constitute the aforementioned condenser lens array in a claim 5.
laim 7] The breadth of the aforementioned condenser lens which constitutes [in / one of terms / a claim 1 or among the aforementioned condenser lens array is a polarization lighting system characterized by being equal to the eadth of the aforementioned polarization beam splitter.
laim 8] It is the polarization lighting system characterized by the aforementioned rectangle condenser lens being an long rectangle configuration in one of terms a claim 1 or among 7.
laim 9] It is the polarization lighting system characterized by the aforementioned condenser lens which constitutes e aforementioned condenser lens array being the aforementioned rectangle condenser lens and analog which nstitute the aforementioned lens board in one of terms among claims 1-8.
laim 10] It is the polarization lighting system which superimposes the light which condenses the light by which tgoing radiation is carried out from the light source section, forms two or more secondary light source images, and rms two or more aforementioned secondary light source images on a lighting field with a condenser lens array and/or ens, respectively.
ch of the light which forms two or more aforementioned secondary light source images is divided into adjacent P larization light and adjacent S polarization light of a couple by the polarization separation prism array equipped with o or more polarization beam splitters arranged by turns and two or more reflective mirrors.
ie polarization direction of P polarization light of a couple and S polarization light which adjoins each other the count of before is arranged by the polarization sensing element.
ie polarization lighting system characterized by things.
laim 11] It is the polarization lighting system characterized by arranging the aforementioned condenser lens array in claim 10 at the optical incidence side of the aforementioned polarization separation prism array.
laim 12] The polarization lighting system characterized by arranging the aforementioned lens at the irradiation pearance side of the aforementioned polarization sensing element in a claim 11.
laim 13] It is the polarization lighting system characterized by at least one being an eccentric system lens among two more condenser lenses which constitute the aforementioned condenser lens array in a claim 11.
laim 14] It is the polarization lighting system characterized by arranging the aforementioned condenser lens array in claim 11 at the irradiation appearance side of the aforementioned polarization sensing element.
laim 15] It is the polarization lighting system characterized by at least one being an eccentric system lens among two more condenser lenses which constitute the aforementioned condenser lens array in a claim 14.
laim 16] The breadth of the condenser lens which constitutes [in / one of terms / a claim 10 or among 15] the oremention condenser lens array is a polarization lighting system characterized by being equal to the breadth of the oremention polarization beam splitter.
laim 17] The aforementioned polarization separation prism array is a polarization lighting system characterized by aving the square pole-like prism composition object with which the reflective film was formed in the interior as the oremention reflective mirror while having the square pole-like prism composition object with which the oremention polarization demarcation membrane was formed in the interior as the aforementioned polarization eam splitter in the claim 1 or the term of either of 16.
laim 18] It is the polarization lighting system characterized by forming the aforementioned polarization sensing ement with the phase contrast board in a claim 1 or the term of either of 17.
laim 19] It is the polarization lighting system characterized by the aforementioned phase contrast boards being mbda / 2 phase-contrast board in a claim 18.
laim 20] It is the polarization lighting system characterized by forming the aforementioned polarization sensing ement by the Twisted Nematic liquid crystal in a claim 1 or the term of either of 17.
laim 21] Projected type display characterized by having the polarization lighting system indicated by the claim 1 or

.e term of either of 20, modulating the flux of light from the aforementioned polarization lighting system, and .dicating by projection.

:laim 22] Projected type display characterized by having the modulation means equipped with the liquid crystal light ılve in which the polarization light contained in the flux of light from the polarization lighting system indicated by the aim 1 or the term of either of 20 and this polarization lighting system is modulated, and image information is .cluded, and the projection optical system which indicates the modulation flux of light by projection.

:laim 23] Projected type display carried out [that a projection indication of the synthetic flux of light which has ırther a colored-light separation means divide the flux of light from the aforementioned polarization lighting system .to the two or more flux of lights, and a colored-light composition means compound the modulation flux of light after .e aforementioned modulation means became irregular, in a claim 22, and was acquired by the colored-light ɔmposition means concerned is given through the aforementioned projection optical system, and] as the feature.

'rocedure amendment 2]

)ocument to be Amended] Specification.

tem(s) to be Amended] 0008.

Aethod of Amendment] Change.

'roposed Amendment]

)008]

Aeans for Solving the Problem] In order to solve the above-mentioned technical problem, the polarization lighting /stem of this invention The lens board for the polarization direction consisting of two or more rectangle condenser nses which have the light source section which carries out outgoing radiation of the random light, and a rectangle-like ɔpearance, condensing the light by which outgoing radiation is carried out from the aforementioned light source :ction, and forming two or more secondary light source images, The composition which has the condenser lens array ıd polarization separation prism array which have been arranged near the position in which two or more ɔrementioned secondary light source images are formed, and a polarization sensing element is adopted. The ɔrementioned condenser lens array consists of two or more condenser lenses. furthermore, the aforementioned ɔlarization separation prism array It is what divides into P polarization light and S polarization light of an adjacent ɔuple each of two or more light condensed with two or more aforementioned rectangle condenser lenses. It consisted f two or more polarization beam splitters and two or more reflective mirrors, and the aforementioned polarization :nsing element arranges the polarization direction of the aforementioned P polarization light and S polarization light, ıd the composition arranged at the outgoing radiation side side of the aforementioned polarization separation prism ray is used for it.

Translation done.]